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INVESTIGATING COMMITTEES.

THAT element of non-success which has been so conspicuous in connection with the greater number of recent commercial enterprises in which electricity has formed the staple plea for enticing money from the purses of the public, has not absented itself from the career of the Consolidated Telephone Construction and Maintenance Company, Limited, the past history of which is now being closely scrutinized by a committee of shareholders. It is quite usual, when the sanguine expectations aroused by the plausible promises contained in prospectuses are followed only by disappointment and loss, for the victims to vent their chagrin upon those who have been responsible for the management of the concern; but it does not very frequently happen that there are insinuations of any misdemeanour more serious than mismanagement. The investigating committee of this company, however, has issued a report which contains accusations of a strong character, directed, by implication only, against those who have formed the directorate during its existence, and, if these should be proved to be correct, the prosecutions and law-suits which are now hinted at would seem to have some justifiable grounds. We are inclined, however, to believe that the committee commenced its labours with too great a disposition to take it for granted that everything had not been fairly and honestly done, and, therefore—neglecting channels of authentic information open to them—rushed hastily to conclusions, based upon insufficient evidence, which a more extended and an unbiased enquiry would not have led them to. Various causes have conspired to limit the remunerativeness of telephone manufacture in England, but these irate and disappointed shareholders recognise but one, for which "mismanagement" is the mildest term. Colonel Gouraud, in his comments upon the report of the committee, directly refuted several of the statements strongest in implied accusation against himself, and the truth of some of his corrections was admitted by Mr. Fitzgerald at last week's meeting. One or two of the shareholders, also, whilst asserting their belief that there was much that required investigation, remarked that there were numerous inaccuracies in the report which time would not permit allusion to.

That an investigation of the affairs of the company, the manner of its promotion and subsequent transactions, was necessary, we fully believe, but that that investigation has been conducted with the requisite amount of care and thoroughness we think we have ample reasons for doubting. It is desirable that a wholesome check should be exerted over the action of managing boards in the shape of a possible investigation of their doings by the shareholders themselves, and we have never been backward in recommending the appointment of committees for that purpose, where it appeared to us that that course was advisable: but that the powers conferred upon such committees should be abused in order to gratify personal antipathies we deeply deplore. In the instance before us, the whole tenour of the report is only too evidently an endeavour to associate Colonel Gouraud with certain apparently questionable proceedings. In the first place it was stated that, having applied for 5,000 shares, he was allotted 15,000, whilst at present he holds only 625; upon correction, however, Mr. Fitzgerald, who may be said himself to compose the "committee," admitted that the actual fact was vastly different to his representation, Colonel Gouraud having been allotted only 3,250 shares; the shares which he had disposed of were sold at a time when he was not a member of the board of directors. Comment has been made upon the appearances and disappearances of Colonel Gouraud from the board; but we think that gentleman's explanation, given at the meeting in May, most satisfactory, testifying as it does to the honourable nature of his motives. His name appeared on the prospectus as deputy-chairman, but almost immediately upon the issue of this he was appointed by the President of the United States a member of a foreign mission, and, as he thought it probable that he would be absent from England for some months, he resigned his position rather than be responsible for the launching of a new business whilst he was abroad. Subsequently, during last year, he was pressed to again join the board, which he at first declined to do, but, after urgent solicitations, he consented. This occurrence has been referred to as suspicious, but in what way it is so we fail to see. Colonel Gouraud answered the personal allusions to himself, and at the meeting last week declared his willingness to reply to any question with regard to transactions which originated whilst he occupied a seat on the board; but no questions were put to him, and he did not go further into the matter, contenting himself with repelling the attacks upon himself, which impartial readers will perceive that he succeeded in doing.

One somewhat singular circumstance, however, which the committee have elicited, in regard to the past members of the board, is the fact—it is stated as such and has not been contradicted—that, with one exception, all the original promoters have ceased to have any connection with the company. As we have before indicated, it is pretty clear that the conduct of all who have at different times been concerned in the management of the company has not been such as to reflect upon them the greatest amount of credit, and we trust the investigating committee will pursue its researches until the irregularities, if there have been any, have been traced home; but what we strongly deprecate is, the spirit which appears to have animated the committee, and the hasty manner in which assertions were made without due care being taken to ascertain that they were strictly true, or that the circumstances would not admit of a more favourable interpretation. That Mr. Fitzgerald's energetic investigation will bear good

results we do not doubt. Already he states that there is a prospect that the manufacturing business will not continue to result in a loss, and he gives hopes of successful business in those countries in which the company has interests. Shareholders in other companies, too, who have reason to be dissatisfied and suspicious, will, seeing the success which has attended his efforts, be more inclined to take a similar step, or, at any rate, the possibility of their doing so will, no doubt, act wholesomely upon any directors who may have a tendency to self-aggrandizement, regardless of the shareholders' wishes and pockets.

THE CLAY TELEPHONE SYSTEM.

THE Clay Commercial Telephone Company of Philadelphia has established in that city an exchange which has now about 250 subscribers. We also learn that over 400 subscribers have been obtained to an exchange for the benefit of the public generally of the city.

Mr. Clay, who is now in this country, has kindly brought before our notice a complete set of his telephonic apparatus, which we herewith illustrate and describe for the information of our readers.

Figs. 1 and 2 give views of the Clay receiver. Fig. 3 is a perspective view of the Clay call, transmitter, receiver, and battery-box. Fig. 4 is a sketch of one of the Clay transmitters, and fig. 5 is a view of the Clay exchange-switch which is operated by any two of the subscribers themselves whenever they have ceased talking with each other.

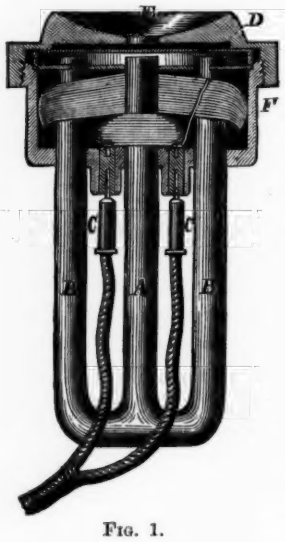


FIG. 1.

The receiver is best shown in fig. 1. A, B, B, represent a permanent steel magnet of which the limb, A, is of one polarity, and the two limbs, B, B, have their magnetism of opposite polarity divided between them; so that there are presented to the ferrotype diaphragm, D, three polar ends, the centre one being say of north polarity, and the other two of south polarity, each one-half as strong as the middle one. The circular diaphragm, D, is of ferrotype iron, and has its edge turned down to form a rim, as with a tin box-cover, to fit a shallow box made of ordinary sheet iron. This box has the centre of its bottom cut out so that there is considerable space between it and the pole of the limb, A. There are two holes cut in the bottom somewhat eccentrically to its centres, so that when the box is put in its place on the magnet poles it may, by turning it on its own plane, be caused to enter slots cut in the two poles, B, B, as shown, and be fastened in position thereby. When once so fixed in place and the diaphragm put on the box, there is no means of adjustment, and it is claimed that none is needed.

The box and cover may be said to be one pole of the magnet, and the end of the limb, A, the other. Of course, variations of the strength of current in the coils, F, of the receiver produce changes in the strength of the magnetic field corresponding to its primal strength. C, C, are the terminals of the usual receiver cord conductor, connected with the ends of the coil, F, of fine wire as usual. The winding of F is peculiar in its way of surrounding the poles. It is first wound as a skein of suitable size, and is then formed as shown and placed over the poles, so that it surrounds them all collectively but no one individually.

FIG. 2.

The receiver is hung upon a fixed hook as shown in fig. 3. When it is removed by the operator a tongue projecting from the box within the bow of the hook is raised by the removal. The raising of the tongue moves a switch within the box to make the necessary electric circuits. The battery jar is placed within the cupboard below the inclined shelf, and this latter is used as a place for writing while making notes of conversation over the line.

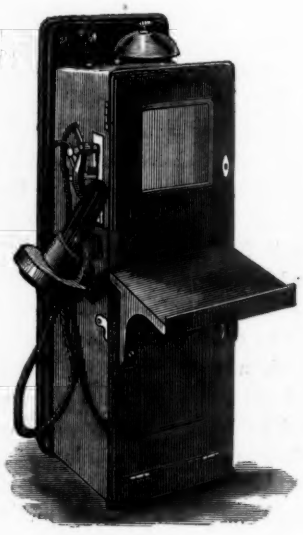


FIG. 3.

The diaphragm of the transmitter is of wood, square, between $\frac{1}{16}$ and $\frac{1}{8}$ of an inch thick, and firmly fastened at its edges to the box which encloses the other parts. At the centre of this diaphragm is fastened a metallic plate on which is a platinum contact-piece. A carbon tubular cylinder fits loosely on a wire, which is bent so that its end enters the hole in the carbon cylinder. This wire is soldered to a metal band, which is fastened to the insulating cover or casing of the induction coil. Between the carbon cylinder and the wire, and soldered to the latter, is another platinum contact. The core of the induction coil is a rod of very hard cast iron. One end of the core is loosely pivotted as shown, and the other end of the core is allowed to move loosely between the limbs of a U-shaped guide wire shown projecting from a piece of iron.

We need not repeat that increased pressure between contact surfaces, such as we are considering, decreases the resistance of the circuit, of which they form a part; that such decrease of resistance causes increase in the strength of currents flowing in the circuit; and

that there is a corresponding increase of the magnetic attractive force of an electro-magnet within the circuit. In this case, then, increased pressure between the contact surfaces causes the end of the core to correspondingly attract the iron mass above it, and, as that mass is fixed, the core moves toward it to counteract the tendency which would otherwise become active, to break the contacts between the electrodes.

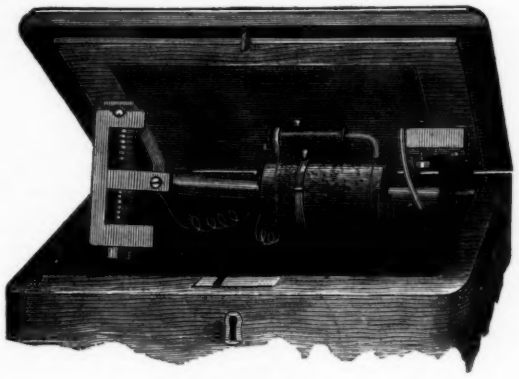


FIG. 4.

The transmitter is said to respond to a weak or loud voice equally well, though of course not in equal strength. Loud or violent talking does not produce a rattling sound in the receiver, as is the case with the ordinarily adjusted transmitters familiar to the public.

Fig. 5 is a view illustrative of the Clay automatic exchange switch and system. A perforated metallic plate, is in electrical connection with the telephone at the central office.

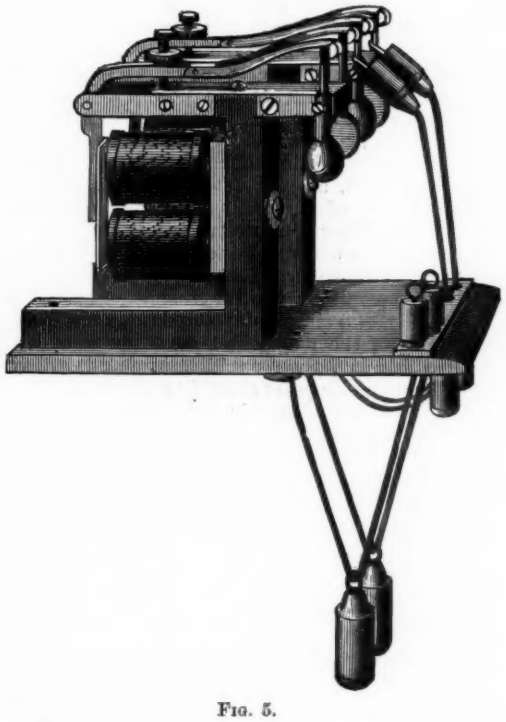


FIG. 5.

The armature of an electro-magnet is mounted on a base, and two catches are pivotted to it at the opposite end. Two levers are pivotted to the base, and are arranged to abut, respectively, against the catches when in normal position. This position is vertical, but a horizontal or inclined arrangement may be adopted instead. The levers are provided with springs or weights for holding them in a normal position, and they are insulated from the catches at the points of contact. They are also insulated from each other by the base, which is of wood, or other insulating material.

Each line wire depends from the perforated plate through one of the perforations thereof, and having at the top a metallic piece, which is held in contact with the wall of the perforations of the plate, the wire having an attached weight to ensure good contact. The top of each metallic piece terminates in an eye, which, when the wire is raised, may be fitted on either of the two levers. To complete the circuit a wire extends from earth to the telephonic instrument of the subscriber.

The operation is as follows :—When one subscriber wishes to communicate with some other subscriber, he first removes his telephone from its hook, which forms part of the signalling instrument. This removal allows the mechanism of the signalling instrument to close the circuit with the central office through the connections above described. After the central office learns the requisition from the subscriber, the operator takes the eye of the respective line wire and attaches it to the respective lever. In so doing, the eye is necessarily brought into electrical contact with the catch for said lever, and lifts the catch. As this catch is in metallic connection with the generator by means of the wire, a momentary circuit is established through the telephone of the first subscriber, and this produces a gurgling noise, which notifies him that his requisition is attended to. The wire of the subscriber who is called for is then manipulated in like manner, and when the metallic eye raises the catch with which it comes in contact, it completes a momentary circuit for that subscriber's notification like those above described, except that the signalling instrument and not the telephone of the latter subscriber is in circuit. He will thus be notified by the sounding of his bell. When the parties have finished talking, the telephones of their instruments are hung upon the respective hooks of their call-bells or signalling apparatus, which causes the mechanism of the latter to be set in motion. This generates a current of electricity for the call-bell mechanism, and this current is of sufficient strength to magnetise the cores of the magnets and attract the armatures, thereby raising the catches from the levers. The weights of the respective telephone wires will then cause the said levers to turn outwardly until the eyes drop off from them, thus breaking the circuit. The springs or weights of said levers then return them to their normal position, and the catches fall again by their own weight (the armature being no longer attracted) into the position shown.

There are as many of these automatic switches provided at each central station as are needed to work the necessary number of simultaneously operated pairs of subscribers' instruments. The Clay system is said to work most satisfactorily, and the exchange system appears to be particularly ingenious, but the inventor has some very curious ideas concerning the method of winding the coil in his receiver, the effects of induction upon his apparatus, and other minor matters. We do not agree with his theories ; but as our object is not to discuss with him but merely to describe his instruments, we need not now at all events enter further into the subject.

VOLTA AND MAGNETO ELECTRIC INDUCTION.*

By WILLOUGHBY SMITH, M.R.I.

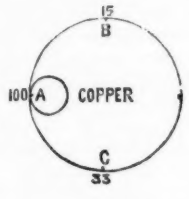
(*Continued from page* 8.)

ARAGO'S discovery that copper, a non-magnetic metal, was influenced by a rotating magnet, or that a magnet was, in the same way, affected by a rotating disc of copper ; was looked upon at the time as a new and remarkable phenomenon in induced magnetism by

* A lecture delivered at the Royal Institution, June 6th, 1884.

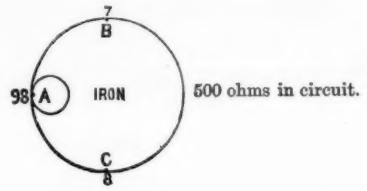
philosophers both in England and other countries; but it was Faraday who, by the assistance of his knowledge of the evolution of electricity from magnetism, gave the true solution, by proving it to be the effects of electrical currents induced in the disc on account of its motion in a magnetic field. He not only proved by simple experiments the correct interpretation of the phenomenon, but he saw the way to making the discovery of Arago a new source of electricity, not despairing, by the aid of his knowledge of terrestrial magneto-induction, of being able to construct a new magneto-electric machine. For this purpose, he arranged an apparatus, similar to the one I have here, which is simply a permanent magnet so fixed that discs of metal or other substances can be rotated between its poles. Two wires leading one from each terminal of a galvanometer were applied to any desired part of the revolving disc, and the deflections on the galvanometer noted. The first experiments were made with a very large compound permanent magnet, and with what would now be termed a quantity astatic galvanometer. His discs of metal were twelve inches in diameter, and about one-fifth of an inch in thickness, fixed upon a brass axis. He experienced difficulty in making contact between the terminals of the galvanometer and the edge and other parts of the revolving disc, as also in maintaining uniform velocity of rotation. With a much smaller magnet and a more sensitive galvanometer, the results were more striking. Thus, with his accustomed simplicity, he demonstrated the production of a permanent current of electricity from an ordinary magnet, at the same time asserting that with powerful magnets and the rapid rotation of a copper disc, very strong currents would be produced. What a wonderful lesson this apparently simple machine teaches, for it is able to exert the power that has its origin within itself on external matter, without in any way exhausting or diminishing that power!

The apparatus that I employed for my experiments is the same that I shall use this evening. On a stand is fixed an electro-magnet, the poles of which are so placed that the rim of the disc under experiment can be freely revolved between them. The total resistance of the wire is 13·75 ohms, and through this flows the current from 12 Leclanché cells. The same galvanometer is used as with the other experiments, being brought in circuit with the disc by means of the axis on which the disc revolves, and a metal brush which forms a rubbing contact on the rim of the disc; this, working on a fixed centre, can be readily shifted to any part of the circumference of the revolving disc. The disc is revolved by this cone-shaped pulley, worked lathe fashion, connected by an endless band to a small grooved pulley fixed on the same axis as the metal disc. We will now make a few experiments with the



copper disc, which is now revolving at the speed of 1,000 revolutions per minute, and the connections are so made that the current will be taken from the rim of the disc just as it passes between the poles of the magnet. On pressing this spring the circuit is complete, and you observe the effect of the current on the scale of the galvanometer; it is about 100 divisions. We will now remove the contact to about one-fourth of the diameter of the disc or top position, so that the current will be taken at that distance from the poles of the magnet as the disc is approaching the poles; now, on completing the circuit, you observe the deflection is reduced to about 15 divisions. The contact will now be removed to the opposite side, or bottom position of the disc, so that the current will be taken at the same distance from the poles, but after that part of the disc has just passed between them; on completing the circuit you see the deflection has increased to 33 divisions. Let us note these results as follows:

We will now replace the copper disc with one of iron, and repeat precisely the same experiment. We find that the current from position A is so great that it is necessary to insert a resistance of 500 ohms in the circuit to bring the beam of light on to the galvanometer scale; as before shown, by means of inserted resistance we can obtain any desired deflection. It is now about 98 divisions, and that we will take as the right measure for position A. We take B or top side position, and you observe that the deflection is only seven divisions; the connection is now placed at position C or bottom side, and we get but very little more current, as the deflection is only increased by one division. The results with iron may therefore be noted as follows:—



If we compare the results of these experiments with those obtained with the same metals in volta-electric induction, we see that iron remains fairly uniform in its results in both cases, but that copper behaves differently. You must not, please, take the figures given as being absolutely correct, the experiments having been somewhat hurriedly made, and merely given with the view of enabling you to understand the results of carefully made experiments with various metals. These results are graphically shown on the plate marked fig. 2, and, as the measurements are to scale, they can be directly compared with each other. The large circles represent the revolving discs, the small ones show the position of the poles of the electro-magnet, and the arrows the direction of rotation. The boundary lines show the electromotive force at every point round the revolving disc; thus in every case the strongest point is, as might be expected, directly in front of the poles of the exciting magnet, the strength gradually fading from thence on either side. The dark portions show the excess of inductive effect there produced, relatively to a point equidistant from the magnetic poles, but on the other side. If the current set up in the metal simply depended upon the intensity of that part of the magnetic-field through which the metal was passing, then equidistant points on either side of the magnetic poles should produce equal deflections, because the magnetic intensity is equal; on inspecting the diagrams, however, it appears as if a very sluggish inductive effect were produced in the diamagnetic metals of high conductivity, the sluggishness increasing with the conductivity of the metal, as though the atoms took a comparatively long time to accommodate themselves to the changes in the magnetic-field through which they were passing. This, I think, confirms the theory I have ventured to advance, with respect to copper while under the influence of induction.

If, as in the case of volta-electric induction, the lines of force are generated too quickly; or, as in the case of magneto-electric induction, the diamagnetic body passes too quickly through the magnetic-field; the atoms of the substance, in each case, have not time to polarise with sufficient rapidity to radiate in the same time or place as when influenced more slowly by this force. This would account for the apparent interruption of the lines of force by the copper plate in the volta-electric experiments, and also for the "drag" or retardation on the disc of the same metal as shown by the dark colour in the diagram whilst part of it is passing quickly through a mag-

netic-field. That being the case, it is easy to perceive that a speed of the copper disc might be attained when the current would be *nil*, through the atoms being unable to polarise in the allotted time. Not so with magnetic metals as iron or nickel, in each of which the atoms appear to be very susceptible to magnetic influences, and to polarise very quickly, as shown by the way in which part of the disc is affected just before entering between the poles, as shown in the dark colour in the diagram marked 3.

The atoms must as quickly depolarise, as you perceive there is but very little of what I have termed "drag" in those metals. The consequence of this is that with iron the amount of current is nearly in direct proportion to the speed of the disc, whereas with copper the increase is very small, the current produced by the two metals being as 1 to 7, at a speed of about 1,300 revolutions per minute. The higher the specific conductivity of the diamagnetic metal the greater the "drag," and consequently the less the current at the poles, this being more manifest at the high speeds, which does not, however, agree with the results obtained by Faraday, for he found that the currents were proportionate in strength to the conducting power of the bodies experimented with; or, in other words, that the higher the conductivity the greater the current; whereas I find the reverse to be the case, as shown on the diagram before you.

Faraday also obtained much better results from copper than from iron, and thus he recommended copper for his new magneto-electric machine. Here, again, my results do not agree with his, for I find that iron gives much better results than copper, as shown on the diagram, and also that iron has the great advantage that the current increases almost in direct proportion to the speed, whereas copper does not; in fact, as already stated, a speed might be obtained at which copper would give *no* current.

Faraday, in summing up the results of his experiments on Arago's phenomenon, says, "Nothing can be more clear, therefore, than that with iron and bodies admitting of ordinary magnetic induction, opposite poles on opposite sides of the edge of the plate neutralise each other's effects, while similar poles exalt the action. But with copper and substances not sensible to ordinary magnetic impressions, *similar* poles on opposite sides of the plate neutralise each other, and opposite poles exalt the action." Perhaps you will more readily grasp the subject by reference to the diagram marked 4, in which P represents the

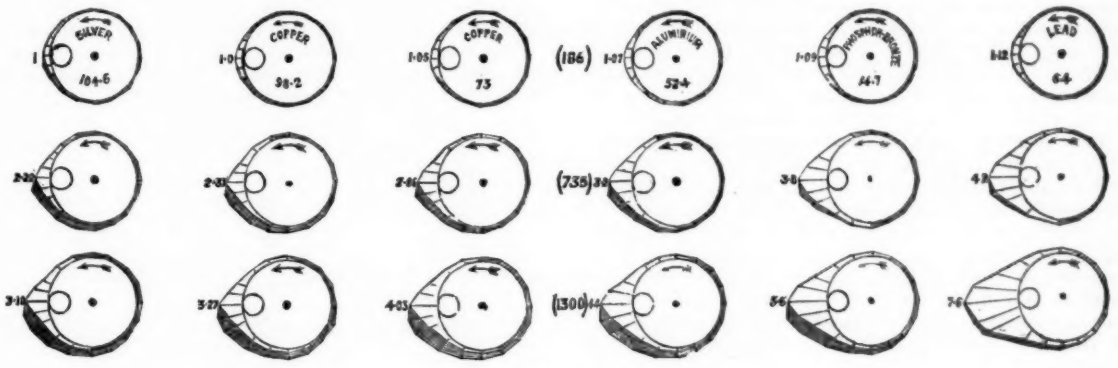


FIG. 2.

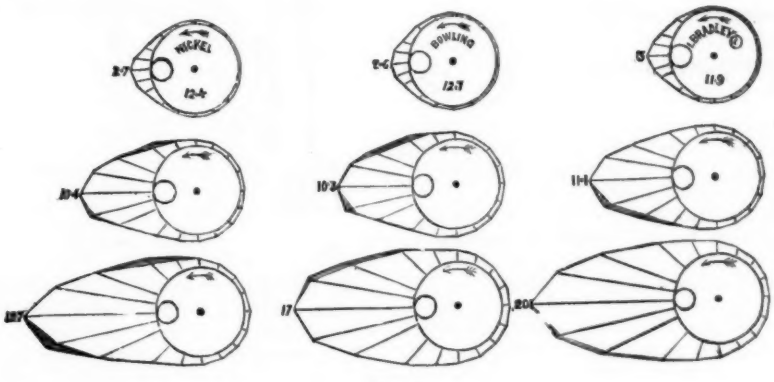


FIG. 3.

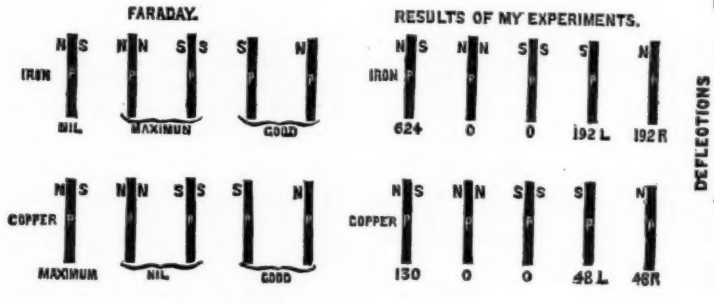


FIG. 4.

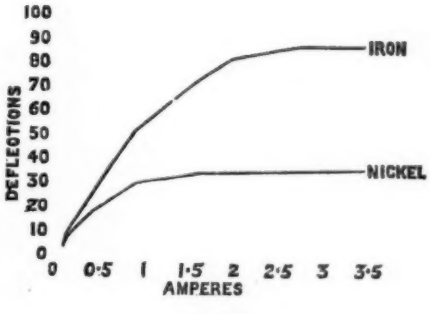


FIG. 5.

plates of metal, and the other letters the respective poles of the magnet and their position. Here, again, it will be seen that the results obtained by mé are opposed to those given by Faraday. I have given the actual figures obtained in my experiments, and it will be seen that the only difference between the metals copper and iron is, that iron gives the higher current of the two, as it has done in all my experiments.

I have no doubt but that we should be able to get approximately near for all practical purposes to the relative conductivity of metals by revolving discs of the metal under test in a magnetic field, and measuring the amount of current between the poles or the amount of "drag." The results given on diagram 5 show how suitable the method also is for obtaining the saturation point of the cores of electro-magnets, whether of different qualities of iron or other magnetic metals.

Very recently an Electrical Congress held in Paris agreed to an universal system of electrical units. I believe the value of some of the units to be adopted was determined by passing masses of metal at varying velocity through a magnetic field of uniform intensity and noting the amount of current so produced. I understand that the results obtained by different experimenters did not agree, and from what I have shown you this evening you will readily understand the reason of the discrepancy. To obtain accurate results the influence of what I have called "drag" must certainly be taken into the calculations as an important factor.

ELECTRO-MOTORS.

ALTHOUGH the technical journals in this country and abroad have frequently published paragraphs and descriptive illustrated articles on the telpherage system of Prof. Jenkin, we do not think it has yet been generally mentioned that the telpher lines supplied to South America and that for the Royal Agricultural Society's Show at Shrewsbury are worked in connection with the electro-motors designed by Mr. A. Reckenzaun.

We understand that Mr. Mylne of the Telpherage Company, representing Prof. Jenkin, has recently made some tests with a motor employed on the telpher line at Weston.

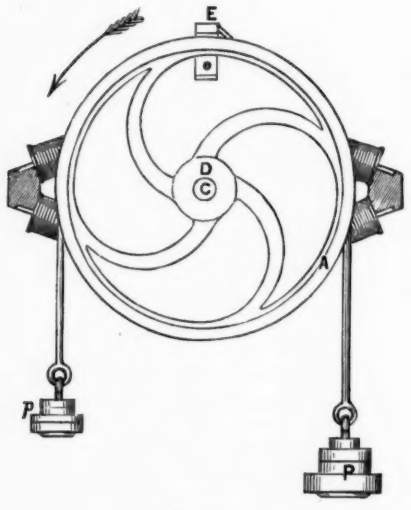


FIG. 1.

From the results given in the appended table it would appear that the Reckenzaun motors, considering their small size and comparative lightness, show a very fair efficiency. We are assured that there is not the slightest sparking at the commutator brushes, no matter at what speed the motor is revolving or even with the sudden and frequent reversals of current required in Prof. Jenkin's system.

These machines are provided with reversing gear, and weigh, complete, 117 lbs.; they will work continuously up to 1·5 brake horse-power, or, intermittently, to as much as 2 horse-power. Their dimensions are 16 inches long, 16 inches wide, and 8½ inches high; the resistance of the armature is 0·455 ohms and that of the field-magnets 0·090, giving a total resistance of 0·545 ohms between terminals.

The power tests were made by Prof. Jenkin's own dynamometer, the construction of which may be gathered from the sketches. It consists of a cast-iron V grooved pulley fixed on a shaft, C, by means of an American chuck, D, in order that it may be fitted to spindles of various diameters. A loose wooden pulley, B, having a well-lubricated gun-metal boss, is threaded

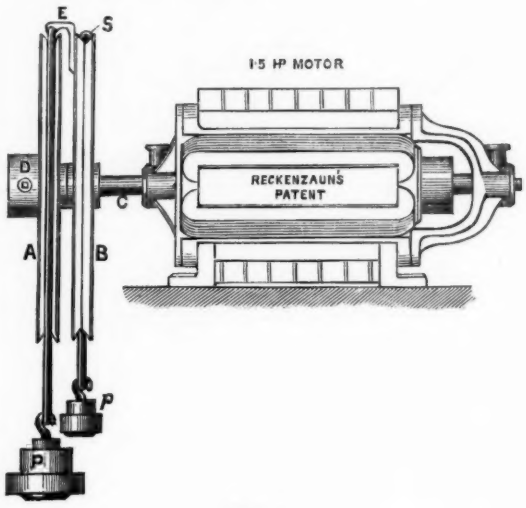


FIG. 2.

upon the motor spindle, C. The cord passing over the upper quarter of the circumference of the wooden pulley, B, is fastened by an eye, S, and carries the smaller weights, *p*. Another cord held by the bracket, E, which is fixed to the loose pulley passes over a quarter circumference of the iron (fast) pulley, A, and this cord with weights, P, determines the work absorbed by friction; the circumference of cord in this case = 3·09 feet.

By adding or removing weights on either cord the speed or power can be varied. An advantage which this dynamometer has over the Prony brake is in the fact that no soap and water lubrication is required. The following table shows a few of the tests :—

Rev. per min.	P − *p* lbs.	H.P. dynamometer.	Current ampères.	E.M.F. volts.
2244	8·25	1·73	29·8	75·8
1984	8·25	1·53	29·4	69·9
1784	12·25	2·04	41·7	72·5
1300	9·5	1·15	31·5	52·3
996	9·75	·91	31·9	60·1
548	11·75	·60	36·5	37·3
428	11·25	·45	35·2	31·8

$$\text{H.P.} = \frac{3{\cdot}09 \times \text{revolutions} \times (\text{P} - p)}{33000}.$$

Do any of our readers know of an electro-motor weighing less than 160 lbs., giving the same power and efficiency as the apparatus to which we have referred?

We may mention that these motors are manufactured by the Electrical Power Storage Company, Mr. Reckenzaun being highly satisfied with their construction both mechanically and otherwise.

THE ORGANISATION OF THE POST AND TELEGRAPH SERVICE IN FRANCE.

(*Continued from page* 69.)

Telegraph Instruments.—The electrical communications would have been naturally insufficient, if the use of improved instruments had not checked the excessive cost, which would have resulted from the erection of an indefinite number of wires.

The working capacity of these wires, being considerably increased by the use of those same instruments, it has placed at our disposal certain of the existing wires and decreased the number of those which we otherwise would have been obliged to erect.

These disengaged wires thus supply to the service very useful additional means to work the intermediate stations and to satisfy the special wants of the Press, the Stock Exchange, &c. The system thus gains a reserve, which provides against any unforeseen or accidental changes in the telegraphic transit.

Telegraph instruments should transmit signals in an accurate and regular manner, from the sender to the receiver; it is very desirable that those signals should leave a record, to avoid mistakes, inseparable from a reading which cannot be checked, and to point out precisely who is responsible.

These considerations have determined us to replace the needle instruments by Morse instruments; and on lines, where the traffic justified it, the Morse, by simple Hughes, or by Morse connected up to work duplex; finally, these two last systems, by rapid senders, such as the Meyer, Wheatstone, Baudot.

The needle instrument is one of the simplest apparatus; it is still being worked in a large number of railway stations; clerks easily learn to work it, but the handling is slow, and the transmitted messages do not leave any record. The Administration therefore decided that it should be replaced by Morse instruments in all the amalgamated offices, and the number of needle instruments, used on the telegraph system of the State, which in 1876 amounted to 1,247 has come down to 633, on the 1st July, 1883.

Morse Instrument.—From the very beginning of electrical telegraphy it has been the aim to discover a system which would allow of keeping a record of the signals. This problem has been solved in a very simple manner by Morse, whose instruments are being used on all the smaller lines.

The average speed is from 20 to 30 messages, or say 400 to 600 words, per hour.

The number of Morse instruments used in France amounted in 1876 to 3,853; this has successively been increased in 1877 to 4,148; in 1878 to 5,348, and on the 30th June, 1883, it reached 7,702.

Experiments made in the workshops of the central depot in Paris, have enabled us to make certain alterations in the Morse receivers, so as to simplify their construction and to improve their working. By applying the duplex system to the Morse instruments (simultaneous transmission in opposite direction), a speed from 20 to 45 messages per hour may be obtained. One wire is at present working duplex.

The reason that this latter system has not been extended to a larger number of lines, as in England, is that the Hughes instrument, the speed of which is greater, does at present service on 275 of our busiest wires. Besides, it is only because of the insufficient speed of the Morse and sounder, that the English Administration has been obliged to increase the duplex installations.

Hughes Instrument.—The Hughes, besides its greater speed, which is from 40 to 60 messages, or 800 to 1200 words, per hour, has the further advantage of producing the messages, printed in typographical letters, and thus to allow of their being checked. It is therefore used on lines which are constantly at work; the number of messages per day forwarded over those lines varies between 250 and 500. The number of Hughes instruments used in France, which on the 1st January, 1878, amounted to 314, has successively been increased, on the 1st January, 1879, to 332; on the 1st January, 1882, to 502; on the 1st January, 1883, to 526. It reached 586 on the 1st January, 1884.

Some excellent modifications have been introduced in the mechanism and in the electrical connections of this instrument, two of which were effected by officials of the French Administration (Messrs. Terral and Mandroux). A telegraph clerk, M. Humblot, has succeeded in substituting for the weight, which drives the mechanism of the Hughes instrument, a hydraulic motor of his invention, which gives very good results. Owing to this innovation the working of the instrument is less troublesome and more accessible to female operators.

Wheatstone Instrument.—The Wheatstone, which obtains a speed of 100 messages (say 2,000 words) per hour, is worked on four of our most important lines. It transmits automatically messages which have first been produced on a perforated paper slip. The speed with which signals are transmitted is very much increased by the successive sending of currents in opposite direction.

A royalty of 1,250 francs per instrument was till recently paid to the heirs of the inventor; but this royalty ceased on the 10th March, 1883, on which day the patent expired.

The number of our Wheatstone instruments, which amounted to 4 in 1876, was 8 on the 1st January, 1884.

Meyer Instrument.—M. Meyer, an official of our Administration, has invented an instrument which, owing to an ingenious distribution of time and labour, places one and the same line successively in communication with four or six different keys, thus allowing of the transmission, at the same time, of four or even six messages.

This instrument obtains a speed of 75 messages or 1,500 words per hour in the first case.

The application of the Meyer instrument for the simultaneous transmission to three stations on the same wire has met with the greatest success between Paris, Caen and Cherbourg.

Baudot Instrument.—The multiple and printing instrument invented by another official of the telegraphs, M. Baudot, who has received a diploma of honour, at the International Electrical Exhibition in Paris. and who had already received the large gold medal and the Cross of the Legion of Honour, at the Universal Exhibition of 1878, has, on our busiest lines, attained a speed of nearly 200 messages, or 4,000 words, per hour.

The time occupied by a signal to travel over the longest overhead wires, is so small that a long time is lost between two consecutive signals of one and the same instrument. This interval may thus be filled up, by the signals of other instruments, and it appears that there is no other obstacle to this multiplication of messages, by dividing the time, but the duration itself of the generation of electricity.

It is on this principle that M. Baudot has constructed his instrument, which transmits simultaneously six messages with a speed which exceeds that of all the other systems used in France. Besides, owing to an ingenious arrangement called "The Combiner," the receiving instrument prints the messages in typographical letters.

This instrument, after having been submitted to important alterations, is at present working in Paris, on a line with each of the towns of Lyons, Marseilles, Bordeaux, Havre, Brest, and Lille, and on the lines from Bordeaux to Marseilles and from Lyons to Marseilles. Moreover, an installation of the duplex Baudot has been used on one of the two wires from Paris to Bordeaux, and also from Bordeaux to Toulouse, and from Marseilles to Nice. The results obtained are excellent, and this system is now rapidly becoming general.

We also hope that the same manner of transmission may soon be extended to certain international lines.

The Administration has, conjointly with the inventor, entered into a lawsuit, referring to this instrument, against a former official of the Administration who, under the pretext of having invented a similar instrument, attacked M. Baudot for infringement; this official, notwithstanding the assistance which the Administration had offered to him to construct his instrument, had never shown it in a finished state.

The Courts of Paris, by judgment of the 7th May, 1880, have decided in favour both of the Administration and of M. Baudot, and have refused the claim of the defendant.

The Court of Appeal has admitted the appeal against this judgment, and has referred the suit to the Courts of Amiens.

The case will therefore be tried again before that court.

Experiments have been made with the idea of adopting the same kind of transmission, suitably modified, on the submarine cables which connect us with Algiers; favourable results may be expected.

Up till now, the special conditions under which submarine cables of great length are worked, compelled the use of special instruments, such as the mirror, but this latter possesses the inconvenience of being troublesome in the working, very sensitive and little trustworthy, the signals being produced by the oscillation of a luminous ray, in a dark room, where the clerk is constantly on duty.

This instrument has been replaced by the syphon recorder, the principle of which is similar, but which possesses the advantage of leaving a record of the oscillations which produce the signals.

(To be continued.)

Telegraphic Money Orders.—With reference to the statement to the effect that the Indian Post Office is about to introduce the telegraphic money order at a charge of 1 per cent., plus the cost of telegram, Kenric B. Murray, F.R.G.S., F.S.S., writes to a daily paper, remarking that no such system exists as yet in this country, although the British postal services produce a profit of over three millions sterling annually. This surplus proves that the Post Office disposes of quite sufficient funds to enable it to introduce a new service should it be proved that the necessity exists for its creation. He continues:—"I understand that the Postal Department has several times made inquiries into the possibility of organising such a service for the United Kingdom, and no favourable decision appears to have been arrived at up to the present. I trust that the knowledge of the fact that one of the dependencies of this kingdom will shortly possess one considerable postal facility more than the mother country is able to give, will bring sufficient logical pressure to bear upon the Post Office and Treasury as to induce them to get over whatever technical difficulties may lie in the way by the creation of a service which, as all travellers are aware, has for a number of years past been in active operation in nearly all European States."

NOTES.

Electric Lighting.—We understand that the Board of Trade has decided to proceed at once to revoke no fewer than 25 of the provisional orders granted last year for the electric lighting of London and its suburbs. Of this number, 23 are orders which were obtained by the Metropolitan Brush Electric Light and Power Company, which has since gone into liquidation. These orders relate to the electric lighting of Barnes and Mortlake, Bermondsey, Chelsea, Chiswick, Clerkenwell, Finchley, Greenwich, Hackney, Holborn, Hornsey, Islington, Limehouse, Poplar, Rotherhithe, St. George-in-the-East, St. George-the-Martyr, portions of the parish of St. Giles, the parishes of St. Luke's, St. Olave, St. Saviour's, Southwark, Shoreditch, Whitechapel, and an order known as the Wandsworth order, which, however, relates to portions only of the parish of Clapham. Of the other two orders which will be revoked, one relates to the lighting of Kensington, and the other is an order granted to the Pilsen-Joel Electric Lighting Company with powers to light those portions of the parish of St. Giles not granted to the Metropolitan Brush Company. So far as London is concerned, the result, therefore, of the numerous electric lighting orders which have been granted during the past two years is, that only eight now remain in force, namely, the St. James's and St. Martin's order, which, with the Hanover Square, Strand, and Victoria district orders, are now held by the Edison and Swan United Electric Lighting Company; the Hampstead order, granted to the Hampstead Electric Lighting Company; the St. Pancras order, granted to the vestry; the order for the lighting of Fulham, which was granted only last May to the West Middlesex Electric Lighting Company; and the order, also granted in May last, to the West London Electric Lighting Company, for lighting portions of the parishes of St. George's, Hanover Square, St. James's, Westminster, and St. Martin's-in-the-Fields. Of these eight orders, the first five have already had their time extended within which to comply with the provisions of the orders, and unless these provisions are complied with before the 15th October next, the powers will be lost unless a further extension of time is granted.

When English investors embarked in the electric lighting enterprise, the *Statist* writes, the justification of their venture was a general belief in the advent of an era of electrical development. Telegraphs and telephones were known to have yielded excellent financial results to their pioneers; and the rank and file of the proprietary have fared, on the whole, exceedingly well. This being so, it might fairly be inferred that, given good administration and some legislative assistance, the new industry would meet with similar success. This view, for which there was much to be said, was crystallised in the public mind by the Exhibitions held in Paris and at Sydenham. With their own eyes the public saw the new light—under exceptionally favourable circumstances, it is true. Having seen the light, they were confirmed in the truth of the assumption that electric lighting was not only in a promising stage of the invention, but that it was ripe for treatment in Parliament by way of restriction and penalty. Accordingly a bill was introduced by Mr. Chamberlain, which in August, 1882, received the Royal Assent. Under the conditions of this Act, it was provided that no electric lighting station should be laid down except under such restrictions as would prevail in the case of a gas enterprise; and, furthermore, that the undertakers should in no case enjoy the monopoly for a longer period than 21 years. The direct consequence of these provisions is, that not a single company has hitherto begun operations under a provisional order, and we venture to prophecy that, under the Act as it stands, no board of directors will incur the responsibility of spending one shilling for that purpose. The only inference from this is, that the Act has not only failed to redeem the promise expressed in the title, *i.e.*, an Act to *facilitate* electric lighting, but it has actually strangled in the moment of birth the electrical infant.

At the twenty-third annual meeting of the members of the North British Association of Gas Managers, held at Glasgow, on the 24th July, Mr. F. T. Linton, Edinburgh, president, in the course of his inaugural address to the meeting, said:—How far other sources, and notably electricity, might come into use as competitors for illuminating purposes with coal gas they need not discuss. The hard logic of facts had shown how impossible in present circumstances it was for electric lighting to compete commercially with gas, and it was difficult to conceive any probability of those circumstances being materially altered. Meanwhile they, as humble fellow-workers in the same field of adapting the forces of nature to the use and benefit of mankind, might well express their unfeigned admiration for that most beautiful and striking example of it which the genuis and patient labour of many eminent men had produced in the various firms of electric lighting, and especially in the incandescent lamp. They had no jealousy of the electric light. They wished it every success in the many special uses to which it was admirably adapted. They did regret, however, that, owing to the action of unprineipled speculators, and, it must be added, to the way in which the public press in too many instances lent itself to the publication of extravagant and misleading statements, the the legitimate extension of the use of electric lighting had been hindered for probably many years, and the money of a number of credulous persons, to the extent of millions of pounds, absolutely squandered. It seemed to him that gas manufacturers, who were threatened, somewhat jubilantly on the part of some people, with total extinction by electric lighting, were, after all, those whom it had chiefly benefited. They must confess that it was largely due to the threatened competition by electric lighting that their profession had been thoroughly roused from a condition of use and wont to one of activity and progress, and that spirit of inquiry induced which had already led to such beneficial results.

At a recent meeting of the Lighting Committee of the Hull Corporation, the Town Clerk reported that on the 10th July, the Council passed a resolution rescinding the contract with Messrs. Siemens for lighting the Old Town with electricity from the 28th July. He had given the necessary notice to Messrs. Siemens, and requested them to make arrangements for removing all their plant and machinery. Mr. Grindell said that although the light with which Hull had been supplied had not been a great success, still they ought to take immediate steps for its continuance by some other firm. Instructions were given to the borough engineer to obtain tenders for, and to report to this committee on, the best means of lighting the public lamps and the Town Hall within the area at present lighted with or without electricity.

The Consolidated Electric Company has just made an addition to its exhibit at the International Health Exhibition in the shape of a set of carriage accumulators, constructed to slide under the coachman's seat. The apparatus consists of five ebonite cells, made quite tight, so that no acid can escape when the carriage moves. The cells, which are 9 in. high, 9 in. deep, and 4¼ in. wide, each contain three positive and four negative plates, made on the B.T.K. system. They are neatly fitted into a well made mahogany frame, and the P and N. poles are marked. This little accumulator will light three lamps of 5-C.P. for five or six hours, and it is believed to be the smallest and most effective for its size of any secondary battery in the market. The frame, with cells complete, measures just 2 ft. in length.

Some experiments were made in the Queen's College, Belfast, on Saturday, in connection with the illumination of the entire college building with the electric light during the sittings of the British Medical Association. The experiments were highly successful.

Atlantic Cables.—In another column will be found the report of the directors of the Anglo-American Telegraph Company, which contains a remark respecting the Commercial Cable Company, and its chances of success. A daily financial paper has taken the board of the Anglo-American Company rather severely to task for having gone out of its way to insinuate that Messrs. Bennett and Mackay's enterprise had no reasonable prospect of making a profit; our contemporary, at the same time, goes rather deeply into the question of the market value of the property of the Anglo-American Company, whose four cables it estimates to be worth £1,656,813; and it continues to remark that even if the two cables of the Commercial Company should cost £1,500,000, as officers of the present companies declare they will do, all told, the comparison is not wholly unfavourable to the new cables, considering that they are the latest fruits of the development of science in cable construction and cable laying.

Post Office Telegraphy.—Regarding the report of the Postmaster-General just issued, the *Times* says:—The increase in the gross telegraph revenue in the past year is not nearly so great as that of the preceding 12 months, probably a much surer index of the state of trade than the increase or decrease of correspondence. The *minimum* price of a telegram at present is such as to preclude its use for private purposes by any but the well-to-do classes, and even in business matters the telegraph is probably placed out of the habitual use of retail tradesmen. The promised reduction of the tariff will be a change of a far-reaching character, and it will be interesting to note its effects. In the meantime communication by means of the telephone is increasing in large towns and business circles, although here again, as the instrument is at present worked, only the upper middle class can participate in the advantages of the invention. The Postmaster-General calls attention to the fact that by far the larger part of the telephonic communication of the country is at present supplied by private companies holding his licence.

Telegraph Supervision.—In answer to Colonel King-Harman, in the House of Commons on Monday, Mr. Fawcett said he would inquire whether it would be better to appoint female supervisors on the Dublin telegraph staff.

Telegraphic Instrument in the House of Commons.—Mr. Gray asked the First Commissioner of Works, last week, if he had yet come to a decision whether he would allow a telegraphic news-recording instrument to be erected in the House for the use of members. Mr. S. Lefevre said he had consulted with the Sergeant-at-Arms, who was of opinion that the proposal of the hon. member did not offer any facilities above the present system under which the telegraphic news to the House was supplied gratis.

Telegraph Revenue.—The telegraph service yielded £590,000 in the period from the 1st April to the 28th July, 1883; this year, between 1st April and 26th July, the receipts have amounted to £520,000.

Patents Act, 1883.—The Board of Trade, with the consent of the Treasury, has made the following reduction relating to certain fees prescribed by the second schedule of the Patents, Designs, and Trade Marks Act, 1883:—In the case of patents granted before the commencement of the said Act, a patentee who has paid the prescribed fee of £50 before the end of four years from the date of his patent may, in lieu of the prescribed fee of £100 payable before the end of seven years from such date, pay the following annual fees:—Before the end of the 7th year from the date of the patent, £10; 8th, £10; 9th, £10; 10th, £15; 11th, £15; 12th, £20; 13th, £20. This reduction came into operation on August 1st.

Meteorological Observations in Australia.—We have received a copy of the report of Mr. Charles Todd, C.M.G., F.R.A.S., Observer, Postmaster-General, and Superintendent of Telegraphs for South Australia, of the meteorological observations made at the Adelaide Observatory, and other places in South Australia and the northern territory, during the year 1881. A mass of information respecting the rainfall and atmospherical phenomena at the various stations is given, which would no doubt prove very interesting to those engaged in similar observations in this country.

Metcalfe v. London and Globe Telephone Company, Limited.—This was a motion, heard before Mr. Justice Pearson on Thursday, to restrain the board of the defendant company from giving effect to an agreement dated June 24th, by which the property of the company was to be handed over to the United Telephone Company. The plaintiff is a shareholder of the London and Globe Company, and moved upon the ground that the meeting at which the agreement was presented for ratification was irregularly held and conducted. It appeared that, certain shareholders being dissatisfied with the explanations given respecting the agreement, a motion was put and carried for the adjournment of the meeting, in order that further and more definite information might be given. A poll, however, was demanded and taken, reversing the effect of the resolution. It was as to the regularity of this course that the learned judge had to decide, and after hearing evidence, he stated that he had come to the conclusion that the meeting was held in a proper and regular manner, and that the poll was properly demanded and taken. Therefore, he dismissed the action with costs.

Miners' Safety Lamp.—The adjudicators for the prize of £500, offered by Mr. Ellis Lever for a new safety lamp, have now reported as follows:—Ellis Lever Competition.—The adjudicators had to examine 108 lamps; of these four were electric lamps, and 104 oil lamps, of which a few were designed to burn mineral oils. With respect to the electric lamps, there was not one which fulfilled, or approached fulfilment of, the conditions of the award. All the lamps which fulfilled the preliminary requirements were submitted to a series of experiments of progressively increasing severity. These experiments, based upon the experience gained by the Royal Commission, and by experiments instituted by other bodies in this country, were calculated to fulfil even exceptional conditions to which lamps may be exposed in actual practice. While there was a considerable number of lamps which behaved satisfactorily under the normal conditions existing in mine workings, the number was reduced to very few as the extreme tests were reached. Of these there is no one lamp that perfectly fulfils the whole of the conditions enumerated in No. 2, and the adjudicators are consequently unable to make the award to any one of the lamps submitted. Among the best there are two which the adjudicators regard as deserving of special mention, viz., the Marsaut lamp, with three gauzes, which most nearly fulfilled the conditions; and the lamp of Mr. William Morgan, of Pontypridd, South Wales, which presents several good features of marked originality.—Thos. Burt, F. A. Abel, W. Grylls Adams, Silvanus P. Thompson.

As a lamp meeting the requirements necessary has not been invented, the £500 reverts back to Mr. Ellis Lever.

Underground Wires in America.—In reference to the Bill passed in New York for the placing of all telegraph and similar wires underground, the *Electrician* of New York says: "The practical confiscation or destruction of this property, as it stands to-day, by a single blow without compensation, can be considered nothing less than an unparalleled outrage." It also says, in allusion to the vague terms in which the Bill is framed, "the poles and wires now standing in the streets of New York and Brooklyn have been placed there under the provisions of, and in compliance with, existing statutes, and, inasmuch as the new Bill makes no provision for repealing previous legislation on the

General Duane has, since August last, been carrying out a series of experiments at Tompkinsville, Staten Island, as to the applicability of electric lights for lighthouse work for the United States Lighthouse Board. The present result of the experiment is that the electric light is found to be ten times more powerful than the oil light, and that for a given amount of light it is the cheaper of the two. It is said that of the apparatus tried the most useful has been found to be that at present in use in the French lighthouses. Among the dynamos tried have been the Gramme, Elphinstone-Vincent, Siemens, and Weston. The report on these experiments is not expected to be ready for some months yet.

Among the exhibits of domestic electric lighting at the International Health Exhibition, by no means the least interesting are those of Mr. T. Tayler Smith, of 4, Circus Place, London Wall, E.C., who has published a pamphlet containing notes on domestic lighting, in which he describes the special character of his fittings. These are for the purpose of giving increased facilities for placing incandescent lamps in any required spot or position, so that a householder, while using a limited number of lamps and paying only for a limited current, can obtain all the advantages of a large current, without incurring the expense and waste which would be usually attendant thereon. For this purpose, the brackets and fittings are provided with hooked projections of peculiar and uniform pattern, so as to be interchangeable; and around the skirting boards, and in the walls, and other places in the rooms, where lights are likely to be needed, a number of spring terminals, protected from touch and almost concealed from sight, are fixed or embedded. These spring terminals are also of uniform pattern and construction, and constitute so many separate points of attachment for the hooked projections on the lamp brackets or other fittings. By this system of removable and interchangeable fittings a material saving in the cost of working plant is said to be effected. To prevent fraud, a fusible safety plug accessible only by the company, controls the current admitted to the house, and should a number of lamps in excess of that agreed upon be lighted at any one time by the householder, the plug will be fused, and the current entirely cut off. In order that the public may be able to judge of the practicability of the method alluded to, a series of rooms have been erected at the International Health Exhibition, wherein the various movable fittings can be seen in use.

The Post Office and the Telephone Companies.—Mr. Jacob Bright asked the Postmaster-General, in the House of Commons on Thursday, the 24th ult., when he would be able to return an answer to the telephone companies in regard to matters in discussion between them and the Post Office department. Mr. Fawcett: The United Telephone Company and its affiliated companies have submitted to me three different proposals, the consideration of which involves many complicated and difficult details, and I am sure it is of great importance that these proposals should be carefully considered in all their bearings. I have personally devoted all the time to their investigation I could spare, but have not yet been able to complete it. I may add that from four other licensed companies I have not received any statement, but I have informed them that if they do not at once furnish me with one I must decide without having their views before me. Although I cannot fix the precise day, I can but repeat the promise that there shall be no unnecessary delay, and I can assure my hon. friend that no one can be more anxious than I am that the question should be speedily settled. (Hear, hear.) Mr. Gray asked whether the right hon. gentleman expected that his decision would be pronounced before the Post Office Estimates were taken. Mr. Fawcett said he felt, in the interest not only of the Post Office and the public, but of the companies themselves, that his decision should not be a hasty one. He would not wish, therefore, to give a pledge as to a particular day. Mr. Gray said that on Monday he would ask the Prime Minister whether he was aware that the question in dispute was as to the right of that House and the Government overriding a legal decision.

In answer to Mr. Gray, in the House of Commons on Tuesday, Mr. Gladstone said: I find that it is true that a certain clause in the Telegraph Bill of the late Government was disagreed to by the House of Commons. Objection has been taken to the sufficiency of the present law. The hon. gentleman asks me whether a legal decision was not obtained by the Department on a technical point. According to the advice which the Government have received the judgment was by no means on a technical point, but upon a substantial matter, and it was to the effect that the Crown was in possession of a certain right by the existing law. That being so, it was the absolute duty of the Department to assert that right. But with regard to the last paragraph of the question, whether "since that date the Post Office had levied a tax upon the use of the telephone, and had imposed constantly increasing restrictions eventually amounting to practical prohibition of its use for exchange purposes," I am not prepared to say what the proper decision to arrive at may be, but the Postmaster-General is seriously engaged in considering whether he can, in justice to the Crown and the country, introduce relaxations into the rules now in force.

The Telephone and Fires.—Commenting upon the paragraph which appeared in a recent issue of this journal, stating that the news of the outbreak of fire at the Theatre Royal, Edinburgh, was received by means of the telephone at the central fire station within a few minutes of the first alarm, the *Electrical Review* of New York says:—"And it may likewise be mentioned that, in any American city of reasonable size, every fire engine house is informed of every fire, and of its approximate location, within *two seconds* of the first alarm. There is a wide field for the introduction of the fire alarm telegraph in England, if our London namesake is correct in its statements."

Overhead Wires.—Sir H. Tyler, on Thursday, the 24th ult., asked the Secretary to the Local Government Board whether he was aware of the number of wires now stretched overhead in various portions of the metropolis, of which about 230 might be counted between the Royal Exchange and St. Michael's Church, Cornhill, and about 200 between the Mansion House and Queen Street, over Queen Victoria Street; and whether, having regard to the danger thus occasioned to persons using the streets, especially in thunderstorms, snowstorms, and high winds, he would consider whether the time had arrived when some steps should be taken to deal with this question. Mr. G. Russell: We are aware that there is a large number of wires stretched overhead in the metropolis, and have no reason to doubt the statement as to the number of such wires in the localities mentioned. In replying to the hon. member for East Aberdeenshire, I stated that we would consider whether a select committee shall not be moved for next session, for the purpose of inquiry and report on the subject. Only six out of the 230 belong to the Post Office, and only four out of the 200.

Ambulance Experiments at Aldershot.—Some very interesting experiments were conducted on Thursday night, July 24th, with a travelling electric arc light as applied to ambulance service in the field. The electrical details were superintended by Messrs. Woodhouse and Rawson.

Proposed Telegraph Consolidation in America.—Persons interested in bringing about a consolidation of the Baltimore and Ohio, the Postal, and the Bankers' and Merchants' Telegraph companies have held frequent conferences, but no definite plan has yet been agreed upon.

subject, there seems to be no reason why electrical companies may not proceed with their overhead construction as heretofore; there would seem to be nothing to prevent their doing so, at least, until November 1st, 1885."

Electric Bell Fitting.—The new Thompson Memorial Home at Lisburn, near Belfast, one of the largest hospitals in Ireland, is now being fitted with a thorough electric bell communication. This will be one of the most complete and extensive electric bell arrangements in the country. The work is being carried out by Mr. C. MacCarthy, who was electrician to the late American Telephone Company, Rotterdam, and who has now taken offices in Queen's Buildings, Royal Avenue, Belfast.

Torpedoes. — The Admiralty is giving increased attention to the importance of torpedoes in naval warfare, and have just issued an order for the purpose of securing uniformity in the arrangements of all torpedo fittings and electric apparatus in Her Majesty's ships. As the only place possessing torpedo schools ashore as well as afloat and an electrical workshop and a staff of officers, Portsmouth has been very properly converted into the head-quarters for the torpedo branch of the service. The dockyard officers at Portsmouth are to confer with the captain of the *Vernon* on all questions relating to changes of existing patterns and to the introduction of fittings for new classes of ships and boats, and once every week the latter is instructed to attend the *levée* of the Admiral-Superintendent for the purpose of considering any matter which may arise in relation to torpedo and electric fittings. It is also ordered that the position of all electric batteries and machines, projectors, and directors, and the stowage of torpedo stores, &c., are to be arranged in consultation with an officer from the department of the Director of Naval Ordnance, the fittings being carried out by the dockyard.

Thunderstorms.—On Thursday week thunderstorms were experienced in England and Scotland. At Nottingham the storm was not so severe as some of those recently experienced. James Harris, a milkman, was selling milk to some men employed upon a new sewer at the east end of the town, when he was struck by lightning, which set fire to his hair, and passed down the left side of his body, causing instant death. In Scotland the storms were accompanied by hail showers, the stones being large. At Kelso the lightning struck a tree near Floors Castle; smoke issued from the trunk for a considerable time after the occurrence. The same tree was similarly injured three or four years ago. At Arbroath, the tower of a memorial chapel in course of erection was struck, the lightning passing down to the pavement, a dark coloured streak marking its path. Two men were rendered insensible, and a third temporarily lost the power of one of his hands. On Saturday morning, the corning-house of the Blackbeck Gunpowder Factory, belonging to Messrs. Dickson and Company, situated near Haverthwaite, about three miles from Lake Windermere, was struck by lightning and destroyed. There were four men working in the house, three of whom were instantly killed, and the fourth badly burnt. It was the only flash seen, so the unfortunate men had not time to leave their house as they always do during a thunderstorm in all powder factories. On the farm of Millburn, Ythan Wells, Insch., after the thunderstorm of Wednesday week, a portion of a field of oats was observed to have suddenly assumed a white or yellow hue, but it was not closely inspected till Sunday, when it was discovered that the place had been struck by lightning. In the centre of the spot where the lightning had struck, the ground is ploughed to an average depth of a foot, and from 1 ft. to 1½ ft. in width, first (from the south) about 3 yards, then an interval of about 4 yards, and finally the furrow is renewed to the extent of about 5 yards. The tops of the blades of oats around are scorched over a large irregular square of 30 yards by 40 yards.

New York Electrical Society.—At a recent meeting of this society, Dr. N. S. Keith pointed out that the number and extent of ærial wires in New York had been largely overstated. On reliable authority he found that the telephone companies had about 6,000 or 7,000 miles, the Western Union about 3,000, and the other companies in proportion. Dr. Keith also drew a plan of a new project for underground conduits and a tunnel under Broadway, in connection with a projected electric railway. The society adjourned to meet again on the second Wednesday in October.

Personal.—We are informed that Mr. Harry South, who till recently was connected with the Hammond Electric Light and Power Supply Company, and who carried out on their behalf several of their most important installations, has taken offices at No. 169, Queen Victoria Street, E.C., and commenced business as an engineer and electric light contractor.

Mr. J. S. Beeman has just severed his connection with the South Eastern Brush Electric Light Company, and is about commencing business on his own account in general engineering work, making electrical subjects a special branch of his profession.

Mr. James P. Maginnis, M.I.M.E., well-known through his improvements in drawing instruments, has recently resigned the chief draughtmanship of the Institution of Mechanical Engineers, and has commenced business as an engineer and draughtsman at 23, Queen Anne's Gate, Westminster. He has had a considerable experience—about eleven years—in practical engineering.

NEW COMPANY REGISTERED.

Indo-European (London to Bombay) Railways Company, Limited.—Capital £10,000,000 in £20 shares with power to increase to £35,000,000. Objects: To construct and work railway, telegraphic, telephonic, electric or other communication in Morocco, Algeria, Tunis, Tripoli, Egypt, Turkey, Persia, India and elsewhere. Signatories (with one share each): G. Davis, 80, Coleman Street; S. Cocker, 46, Southampton Buildings; H. J. Newell, 43, Camberwell New Road; H. B. Worrell, 80, Coleman Street; E. T. Collis, 70, Cloudesley Road, N.; R. A. Henderson, 91, Edgware Road; R. S. Tomlin, 2, Poet's Corner. The signatories are to appoint the first directors; qualification 25 shares; remuneration, £1,000 per annum to the president or chairman, £500 per annum to each vice-president or deputy chairman, and £300 per annum to each ordinary director. Mr. Jean Baptiste Bouville, of Paris, who has prepared plans and estimates for the construction of railways and telegraphs in the countries named, is appointed engineer in chief for seven years at a salary of £4,000 per annum. Registered 28th ult., by Davis & Co., 80, Coleman Street.

OFFICIAL RETURNS OF ELECTRICAL COMPANIES.

Deal and Walmer Electric Light Company.—The statutory return of this company, made up to the 17th ult., was filed on the 25th ult. The nominal capital is £5,000 in £5 shares. Ninety-nine shares have been taken up, and 5s. per share has been called thereon. The calls paid amount to £24 15s. Registered office, 5, Clanwilliam Road, Victoria Town, Deal.

Electrical Association, Limited.—Mr. Alfred Ford, the liquidator of this company, has informed the Registrar of Joint Stock Companies that a meeting of the company was held on the 25th ult., at which an account was laid before the shareholders, showing the manner in which the winding-up of the company has been conducted, and the property disposed of.